

Fatigue of LIGA Ni MEMS Structures

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Research Objective

- The program is investigating the mechanisms of fatigue in LIGA Ni MEMS structures

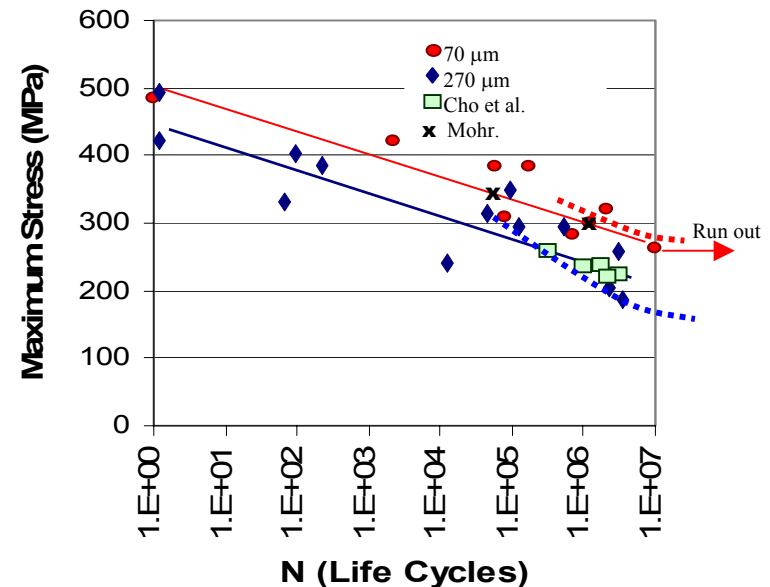
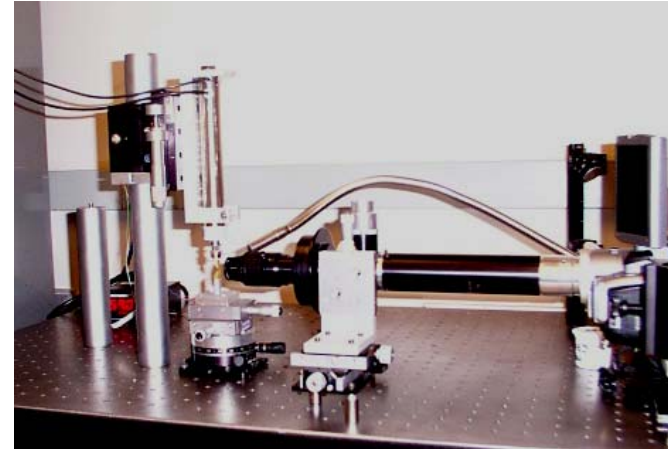
Approach

- Design and build fatigue micro-tester
- Measure stress-life behavior and characterize fatigue fracture modes
- Study crack nucleation and growth mechanisms

Significant Results

- Completed the design and construction of the fatigue micro-tester
- Studied stress-life behavior in LIGA Ni MEMS structures with two different thicknesses (~ 70 and $270 \mu\text{m}$)
- Identified fatigue fracture modes in the Low-Cycle Fatigue (LCF) and High-Cycle Fatigue (HCF) regimes

Fatigue Micro-Tester



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Broad Impact

- Developing fatigue design guidelines and failure analysis tools for the design of LIGA Ni MEMS structures, e.g. accelerometers for the deployment of airbags
- Collaborating with Dr. Tom Buchheit at Sandia National Labs
- Edited special edition of The Journal of Materials Sciences on “Mechanical Properties of MEMS Structures”
- Mentoring of minority students

Fracture surface of thick LIGA sample tested under fatigue at low stresses

